

115TH CONGRESS  
1ST SESSION

# S. 1457

To amend the Energy Policy Act of 2005 to direct the Secretary of Energy to carry out demonstration projects relating to advanced nuclear reactor technologies to support domestic energy needs.

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## IN THE SENATE OF THE UNITED STATES

JUNE 28, 2017

Mr. FLAKE (for himself and Mr. BOOKER) introduced the following bill; which was read twice and referred to the Committee on Energy and Natural Resources

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# A BILL

To amend the Energy Policy Act of 2005 to direct the Secretary of Energy to carry out demonstration projects relating to advanced nuclear reactor technologies to support domestic energy needs.

1       *Be it enacted by the Senate and House of Representa-*  
2       *tives of the United States of America in Congress assembled,*

3       **SECTION 1. SHORT TITLE.**

4       This Act may be cited as the “Advanced Nuclear En-  
5       ergy Technologies Act”.

1   **SEC. 2. ADVANCED NUCLEAR REACTOR RESEARCH AND DE-**

2                   **VELOPMENT GOALS.**

3       (a) IN GENERAL.—Subtitle B of title VI of the En-  
4 ergy Policy Act of 2005 (Public Law 109–58; 119 Stat.  
5 782) is amended by adding at the end the following:

6   **SEC. 640. ADVANCED NUCLEAR REACTOR RESEARCH AND**

7                   **DEVELOPMENT GOALS.**

8       “(a) DEFINITIONS.—In this section:

9               “(1) ADVANCED NUCLEAR REACTOR.—The  
10 term ‘advanced nuclear reactor’ means a nuclear fis-  
11 sion or fusion reactor, including a prototype plant  
12 (as defined in sections 50.2 and 52.1 of title 10,  
13 Code of Federal Regulations (or successor regula-  
14 tions)), with significant improvements compared to  
15 commercial nuclear reactors under construction as of  
16 the date of enactment of this section, including im-  
17 provements such as—

18               “(A) additional inherent safety features;

19               “(B) a significantly lower levelized cost of  
20 electricity;

21               “(C) lower waste yields;

22               “(D) improved fuel performance;

23               “(E) increased tolerance to loss of fuel  
24 cooling;

25               “(F) enhanced reliability;

26               “(G) increased proliferation resistance;

1               “(H) increased thermal efficiency;

2               “(I) reduced consumption of cooling water;

3               “(J) the ability to integrate into electric

4               applications and nonelectric applications;

5               “(K) modular sizes to allow for deployment

6               that corresponds with the demand for elec-

7               tricity; or

8               “(L) operational flexibility to respond to

9               changes in demand for electricity and to com-

10               plement integration with intermittent renewable

11               energy.

12               “(2) DEMONSTRATION PROJECT.—The term

13               ‘demonstration project’ means an advanced nuclear

14               reactor operated—

15               “(A) as part of the power generation facil-i-

16               ties of an electric utility system; or

17               “(B) in any other manner for the purpose

18               of demonstrating the suitability for commercial

19               application of the advanced nuclear reactor.

20               “(b) PURPOSE.—The purpose of this section is to di-

21               rect the Secretary, as soon as practicable after the date

22               of enactment of this section, to advance the research and

23               development of domestic advanced, affordable, and clean

24               nuclear energy by—

1           “(1) demonstrating different advanced nuclear  
2       reactor technologies that could be used by the pri-  
3       vate sector to produce—

4           “(A) emission-free power at a cost of \$65–  
5       \$70 per mWh or less;

6           “(B) heat for industrial purposes or syn-  
7       thetic fuel production;

8           “(C) remote or off-grid energy supply; or  
9           “(D) backup or mission-critical power sup-

10       plies;

11           “(2) developing goals for nuclear energy re-  
12       search programs that would accomplish the goals of  
13       the demonstration projects carried out under sub-  
14       section (c);

15           “(3) identifying research areas that the private  
16       sector is unable or unwilling to undertake due to the  
17       cost of, or risks associated with, the research; and

18           “(4) facilitating the access of the private sec-  
19       tor—

20           “(A) to Federal research facilities; and

21           “(B) to the results of research funded by  
22       the Federal Government.

23       “(c) DEMONSTRATION PROJECTS.—

24           “(1) IN GENERAL.—During the period begin-  
25       ning on the date of enactment of this section and

1       ending on September 30, 2028, the Secretary shall,  
2       to the maximum extent practicable, enter into one or  
3       more agreements to carry out not fewer than 4 ad-  
4       vanced nuclear reactor demonstration projects.

5               “(2) REQUIREMENTS.—In carrying out dem-  
6       onstration projects under paragraph (1), the Sec-  
7       retary shall—

8                       “(A) seek to include diversity in designs  
9       for the advanced nuclear reactors demonstrated  
10      under this section, including designs using var-  
11      ious primary coolants;

12                       “(B) seek to ensure that—

13                               “(i) the long-term cost of electricity or  
14       heat for each design to be demonstrated  
15      under this subsection is cost-competitive in  
16      the applicable market; and

17                               “(ii) the cost-competitiveness of each  
18       design to be demonstrated under this sub-  
19      section is verified by an external review of  
20      the proposed design;

21                       “(C) enter into cost-sharing agreements  
22       with partners in accordance with section 988  
23      for the conduct of activities relating to the re-  
24      search, development, and demonstration of pri-

1           vate-sector advanced nuclear reactor designs  
2           under the program;

3           “(D) work with private sector partners to  
4           identify potential sites, including Department-  
5           owned sites, for demonstrations, as appropriate;  
6           and

7           “(E) align specific activities carried out  
8           under demonstration projects carried out under  
9           this subsection with priorities identified through  
10          direct consultations between—

11           “(i) the Department;  
12           “(ii) National Laboratories;  
13           “(iii) traditional end-users (such as  
14          electric utilities);

15           “(iv) potential end-users of new tech-  
16          nologies (such as petrochemical compa-  
17          nies); and

18           “(v) developers of advanced nuclear  
19          reactor technology.

20           “(d) GOALS.—

21           “(1) IN GENERAL.—The Secretary shall estab-  
22          lish goals for research relating to advanced nuclear  
23          reactors facilitated by the Department that support  
24          the objectives of the program for demonstration  
25          projects established under subsection (c).

1           “(2) COORDINATION.—In developing the goals  
2 under paragraph (1), the Secretary shall coordinate,  
3 on an ongoing basis, with members of private indus-  
4 try to advance the demonstration of various designs  
5 of advanced nuclear reactors.

6           “(3) REQUIREMENTS.—In developing the goals  
7 under paragraph (1), the Secretary shall ensure  
8 that—

9                 “(A) research activities facilitated by the  
10 Department to meet the goals developed under  
11 this subsection are focused on key areas of nu-  
12 clear research and deployment ranging from  
13 basic energy to full-design development, safety  
14 evaluation, and licensing;

15                 “(B) research programs designed to meet  
16 the goals emphasize—

17                     “(i) resolving materials challenges re-  
18 lating to radiation damage or corrosive  
19 coolants; and

20                     “(ii) qualification of advanced fuels;

21                 “(C) activities are carried out that address  
22 near-term challenges in modeling and simula-  
23 tion to enable accelerated design and licensing;

24                 “(D) related technologies, such as electro-  
25 chemical processing or fuel recycling that could

1           reduce nuclear waste volumes or half lives, are  
2           developed;

3           “(E) infrastructure, such as a versatile  
4           fast neutron source or molten salt testing facil-  
5           ity, to aid in research are constructed;

6           “(F) basic knowledge of non-light water  
7           coolant physics and chemistry is improved; and

8           “(G) advanced manufacturing and con-  
9           struction techniques and materials are inves-  
10          tigated to reduce the commercialization cost of  
11          advanced nuclear reactors.”.

12         (b) TABLE OF CONTENTS AMENDMENT.—The table  
13         of contents of the Energy Policy Act of 2005 (Public Law  
14         109–58; 119 Stat. 594) is amended by inserting after the  
15         item relating to section 639 the following:

“See. 640. Advanced nuclear reactor research and development goals.”.

